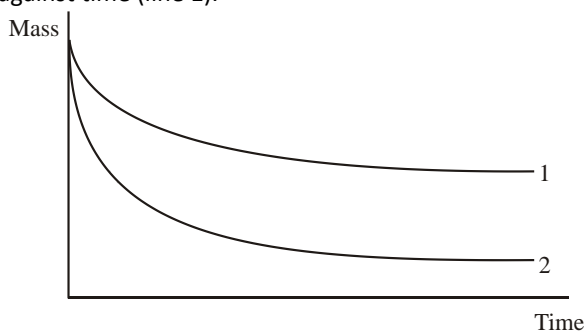


## Topic 06 – Kinetics SL 2010 Exam for REVIEW

Name.....

1. Which of the following is (are) important in determining whether a reaction occurs?
- Energy of the molecules
  - Orientation of the molecules
- I only
  - II only
  - Both I and II
  - Neither I nor II
2. Consider the reaction between solid  $\text{CaCO}_3$  and aqueous  $\text{HCl}$ . The reaction will be speeded up by an increase in which of the following conditions?
- Concentration of the  $\text{HCl}$
  - Size of the  $\text{CaCO}_3$  particles
  - Temperature
- I only
  - I and III only
  - II and III only
  - I, II and III
3. Excess magnesium was added to a beaker of aqueous hydrochloric acid on a balance. A graph of the mass of the beaker and contents was plotted against time (line 1).



What change in the experiment could give line 2?

- The same mass of magnesium but in smaller pieces
  - The same volume of a more concentrated solution of hydrochloric acid
  - A lower temperature
- I only
  - II only
  - III only
  - None of the above
4. The rate of a reaction between two gases increases when the temperature is increased and a catalyst is added. Which statements are both correct for the effect of these changes on the reaction?

	Increasing the temperature	Adding a catalyst
A.	Collision frequency increases	Activation energy increases
B.	Activation energy increases	Activation energy does not change
C.	Activation energy does not change	Activation energy decreases
D.	Activation energy increases	Collision frequency increases

5. Which of the following is (are) altered when a liquid at its boiling point is converted to a gas at the same temperature?
- The size of the molecules
  - The distance between the molecules
  - The average kinetic energy of the molecules
- I only
  - II only
  - III only
  - I and II only

6. Based on the definition for rate of reaction, which units are used for a rate?

- A.  $\text{mol dm}^{-3}$
- B.  $\text{mol time}^{-1}$
- C.  $\text{dm time}^{-1}$
- D.  $\text{mol dm}^{-3} \text{ time}^{-1}$

7. In the Haber process for the synthesis of ammonia, what effects does the catalyst have?

	Rate of formation of $\text{NH}_3(\text{g})$	Amount of $\text{NH}_3(\text{g})$ formed
A.	Increases	Increases
B.	Increases	Decreases
C.	Increases	No change
D.	No change	Increases

8. Which statement is correct about the behavior of a catalyst in a reversible reaction?

- A. It decreases the enthalpy change of the forward reaction.
- B. It increases the enthalpy change of the reverse reaction.
- C. It decreases the activation energy of the forward reaction.
- D. It increases the activation energy of the reverse reaction.

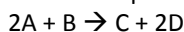
9. Which statement is correct for a collision between reactant particles leading to a reaction?

- A. Colliding particles must have different energy.
- B. All reactant particles must have the same energy.
- C. Colliding particles must have a kinetic energy higher than the activation energy.
- D. Colliding particles must have the same velocity.

10. Which change of condition will decrease the rate of the reaction between excess zinc granules and dilute hydrochloric acid?

- A. increasing the amount of zinc
- B. increasing the concentration of the acid
- C. pulverize the zinc granules into powder
- D. decreasing the temperature

11. The table shows the concentrations of reactants and products during this reaction.



	$[\text{A}] / \text{mol dm}^{-3}$	$[\text{B}] / \text{mol dm}^{-3}$	$[\text{C}] / \text{mol dm}^{-3}$	$[\text{D}] / \text{mol dm}^{-3}$
at the start	6	3	0	0
after 1 min	4	2	1	2

The rate of reaction can be measured by reference to any reactant or product. Which rates are correct for this reaction?

- I.  $\text{rate} = -2 \text{ mol dm}^{-3} \text{ min}^{-1}$  for A
  - II.  $\text{rate} = -1 \text{ mol dm}^{-3} \text{ min}^{-1}$  for B
  - III.  $\text{rate} = -1 \text{ mol dm}^{-3} \text{ min}^{-1}$  for C
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

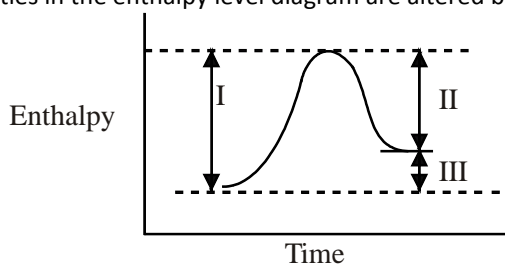
12. In general, the rate of a reaction can be increased by all of the following **except**

- A. increasing the temperature.
- B. increasing the activation energy.
- C. increasing the concentration of reactants.
- D. increasing the surface area of the reactants.

13. At 25°C, 100 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> hydrochloric acid is added to 3.5 g of magnesium carbonate. If the sample of magnesium carbonate is kept constant, which conditions will **not** increase the initial rate of reaction?

	Volume of HCl / cm <sup>3</sup>	Concentration of HCl / mol dm <sup>-3</sup>	Temperature / °C
A.	200	1.0	25
B.	100	2.0	25
C.	100	1.0	35
D.	200	2.0	25

14. Which statement is correct with regard to the catalyzed and uncatalyzed pathways for a given reaction?
- The enthalpy change of the catalyzed reaction is less than the enthalpy change for the uncatalyzed reaction.
  - The enthalpy change of the catalyzed reaction is greater than the enthalpy change for the uncatalyzed reaction.
  - The enthalpy change of the catalyzed reaction is equal to the enthalpy change for the uncatalyzed reaction.
  - The activation energy of the catalyzed reaction is greater than the activation energy for the uncatalyzed reaction.
15. Which quantities in the enthalpy level diagram are altered by the use of a catalyst?



- I and II only
  - I and III only
  - II and III only
  - I, II and III
16. When excess lumps of magnesium carbonate are added to dilute hydrochloric acid the following reaction takes place.



- (a) Outline **two ways** in which the rate of this reaction **could be studied**. In each case sketch a graph to show how the value of the chosen variable would change with time.

- (b) State and explain **three ways** in which the rate of **this** reaction could be increased.

(4)

(6)

- (c) State and explain whether the total volume of carbon dioxide gas produced would increase, decrease or stay the same if
- (i) more lumps of magnesium carbonate were used.

(2)

- (ii) the experiments were carried out at a higher temperature.

(2)

(Total 14 marks)

17. (i) Magnesium is added to a solution of hydrochloric acid. Sketch a graph of acid concentration on the y-axis against time on the x-axis to illustrate the progress of the reaction.

(1)

- (ii) Describe how the slope of the line changes with time.

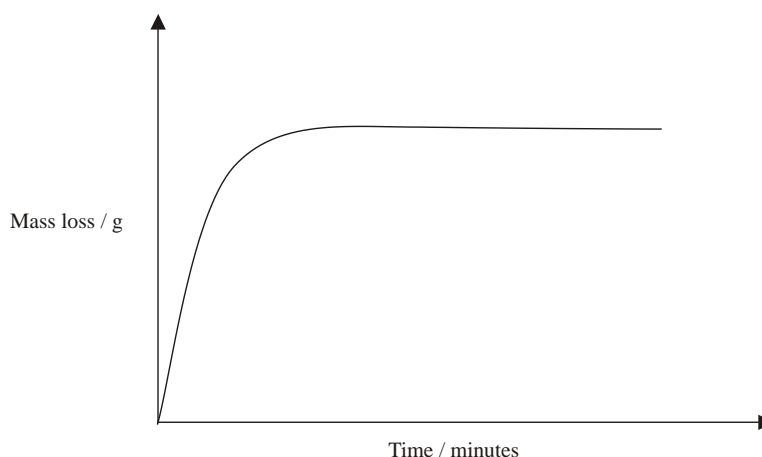
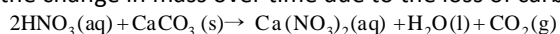
(1)

- (iii) Use the collision theory to state and explain the effect of decreasing concentration on the rate of the reaction.

(2)

(Total 4 marks)

18. Excess  $0.100 \text{ mol dm}^{-3}$  nitric acid is added to a certain mass of powdered calcium carbonate at  $20^\circ\text{C}$ . The rate of reaction is monitored by measuring the change in mass over time due to the loss of carbon dioxide.



- (a) Define the term *rate of reaction*.

(1)

- (b) Explain why the mass loss remains constant after a certain time.

(1)